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The role of diabetes in low back pain compared to non-diabetics

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ABSTRACT

Background: Type 2 diabetes is a prevalent non-communicable disease, affecting significant proportion of the global population, with an estimated 382 million individuals affected. There exists a correlation among diabetes and low back pain. The objective of this investigation was to examine the potential association linking diabetes and low back pain by utilising the Oswestry disability Index as a gauge of the intensity of persistent lower back pain.
Methods: The study was conducted by cross sectional method in which 200 patients with low back pain were included from period of October 2020 to September 2022. Oswestry disability index questionnaire was used for the intensity of lower back pain. Statistical package for the social sciences was used for data analysis.
Results: In this study, out of 200 patients, 59 (29.5%) had diabetes and 141 (70.5%) were without diabetes, with a average age of 53.61±15.07 years. Overall, according to gender, patients were equally distributed, while female and male predominance was seen in diabetics and non-diabetics, respectively.
Conclusions: The distribution of patients as per gender and ODI score did not differ, although more diabetics had a significantly higher ODI score than non-diabetics. A significant increase in blood glucose, HbA1c, microalbuminuria, and ODI score was noted in diabetics compared with non-diabetics, with significant positive associations of ODI with age, blood glucose, and HbA1c. The increased levels of the diabetic profile parameters and their association with the ODI indicate the possible role of diabetes with low back pain.

Keywords: Diabetes, Low back pain, Oswestry disability index, HbA1c

INTRODUCTION

The term "low back pain" (LBP) pertains to any sensation of discomfort or pain experienced in lower lumbar region and inferior gluteal folds, regardless of whether it extends to the lower extremities.[1] One of the most commonly reported grievances to medical professionals, it is widely acknowledged as a leading contributor to global disability.[2] Physical examinations and imaging studies frequently produce normal results, so the diagnosis of low back pain is primarily based on the patient's stated symptoms. Low back pain's underlying cause is frequently unknown.[3,4] Approximately 70 to 85%, back pain is a common condition that affects people at some point in their lives. The most frequent reason for exercise restriction in younger people is back pain.[5] The aetiology underlying this phenomenon is intricate and multifaceted. There exist evident correlations between intervertebral disc disease, advanced age, obesity, and occurrences of low back pain.[6,7]

The prevailing consensus is that the correlation between obesity and low back pain stems from alterations in the mechanical load distribution on the spine due to obesity. However, it is plausible that adipokines and systemic

inflammation also contribute to this association. Obesity is widely recognised as the predominant risk factor for type 2 diabetes, and it is also strongly correlated with the occurrence of back pain.[6,8] Because the specific processes by which each illness contributes to the onset of low back pain are still not fully known, the complex link between obesity, diabetes, and low back pain is still unclear.[7,8]

The complex disease of diabetes has been found to be associated with various clinically significant spine pathologies, as reported in studies.[9-12] Research indicates that there is a significant prevalence of low back pain among adults with diabetes. This correlation persists even after controlling for common risk factors prevalent in this demographic, such as obesity. Regarding how obesity and low back pain are related, various authors have expressed contrasting opinions, while some consider obesity to be a potential contributing factor, it is not necessarily the predominant factor.[13-15] On the other hand, according to several authors, low back pain is influenced by obesity. Furthermore, there has been a suggestion that obesity may serve as a confounding variable or an indicator for other underlying conditions that are the actual aetiologies of low back pain.[16,17] This investigation's goal is to look into any potential correlation between low back pain, diabetes, and urine microalbuminuria within a hospital environment.

METHODS

The study conducted was cross-sectional in nature and was conducted at the Department of Orthopaedics of Bharati Hospital and Research centre, at a Tertiary care hospital, Pune, India. The research was conducted over a duration of 24 months, spanning from October 2020 to September 2022. A cohort of 200 individuals experiencing low back pain were chosen through a process of simple random sampling. These individuals were subsequently categorised into two subgroups based on their diabetic status, namely diabetics and non-diabetics. In each of the above mentioned subgroups, a microalbuminuria test was conducted.

Each participant who was enrolled in the study completed the informed consent form. The research was carried out subsequent to obtaining approval from the institutional ethics committee. The present investigation encompassed a sample of adult patients, irrespective of their gender, who were experiencing low back pain, with or without accompanying radiating pain in the lower extremities. The study excluded individuals who had undergone lumbar spinal surgery in the past. The study participants underwent a battery of diagnostic tests, including HbA1c, blood glucose (BSL-R), and urine microalbumin analysis (spot urine sample test). The data was gathered using a pre-designed proforma that encompassed demographic parameters, an ODI table, HbA1c value, BSL levels, microalbuminuria, history, and patient information obtained through an interview and review of medical records.

Statistical analysis

The statistical analysis was conducted utilising the SPSS (Statistical Package for Social Sciences) version 26.0 software. The frequencies (N) and percentages (%) were computed for the qualitative data. The mean and standard deviation were computed for the quantitative data. The statistical analysis involved the comparison of means between groups through the utilisation of the Student's t-test. Pearson's correlation coefficient was utilised to evaluate the correlation among parameters. A significance level of 0.05 was used to determine statistical significance, with a p-value of less than this threshold indicating significance.

RESULTS

The current study aimed to assess the correlation between the Oswestry disability index (ODI) and low back pain in both diabetic and non-diabetic cohorts. The present study comprised a sample of 200 individuals who reported experiencing low back pain. Out of a total of 200 patients, 59 individuals (29.5%) were diagnosed with diabetes, while the remaining 141 (70.5%) did not exhibit symptoms of the condition. The study reports that the average age of the patients was 53.61±15.07 years, with a range of 18 to 82 years. The gender distribution among patients was evenly distributed, with 100 male and 100 female participants. Among the sample of patients, there were 59 individuals diagnosed with diabetes, with 24 being male and 35 being female. Additionally, there were 141 patients without diabetes, with 76 being male and 65 being female. The (Table 1) displays the distribution of patients by gender among individuals with diabetes and those without diabetes.

Table: 1 Gender distribution among diabetics and non-diabetics.

Parameters	Female	Male
Diabetics	35	24
Non-diabetics	65	76
Total	100	100

The ODI score is a subjective finding and, in the study, sample the scores are interpreted below in the range 20%, starting from 0 till 100 as shown below and the distribution of sample in each range is mentioned along with the number of male and female patients present in that range. In a range of 0-20 %, total patient are 7 out of which 5 are male and 2 are female and in range from 21-40% there were total of 44 patients, 21 of whom were male and 23 of whom were female. Total patients in the range of 41-60% were 82, with 36 male and 46 female patients. 42 individuals, including 25 men and 17 women, made up the 61-80% range group, and in last range group of 81-100%, there were 25 patients, out of whom 13 were male and the rest were female. The diabetics had an ODI score of >41%, while in non-diabetics it is equally distributed among patients, as shown below in (Table 2).

Table 2: Distribution of patients as per the range of ODI score.

ODI Score (%)	Gender		Study group	
	Male	Female	Diabetics	Non-Diabetics
0-20	5	2	0	7
21-40	21	23	6	38
41-60	36	46	28	54
61-80	25	17	17	25
81-100	13	12	8	17
P value	0.3848		0.025	

Table 3: Comparison of age, biochemical parameters and ODI between diabetics and non-diabetics.

Parameters	Diabetics		Non-diabetics		P value
	Mean	SD	Mean	SD	
Age (years)	59.86	12.25	50.99	15.40	<0.0001
BSLR (mg/dl)	176.58	76.31	114.50	27.20	<0.0001
HbA1c (%)	7.94	2.50	5.34	1.11	<0.0001
Microalbuminuria (mg/l)	101.76	165.05	98.36	597.75	<0.0001
ODI	59.55	15.37	51.54	20.89	<0.0001

We found a significant (p<0.0001) difference in means of age, random blood sugar (BSL-R), HbA1c, microalbuminuria, and ODI compared between the diabetic and non-diabetic groups (Table 3). The association between ODI score with age and biochemical parameters was tested using Pearson's correlation coefficient. We found a significant positive association of age (p<0.001), BSL R (p=0.04) and HbA1c (p<0.001) with the ODI score, but not with microalbuminuria (p=0.48) (Table 4).

Table 4: Association of ODI score with age and biochemical parameters.

Parameters	ODI	
	R value	P value
Age	0.261	<0.001
BSLR	0.147	0.04
HbA1c	0.217	<0.001
Microalbuminuria	0.05	0.48

DISCUSSION

The diabetes epidemic is said to have its epicentre in India. By 2025 and 80 million by 2030, the nation's diabetic population is on track to reach the alarming milestone of 69.9 million cases. This indicates that a 266 percent increase is anticipated for the developing nation.[18] Diabetes is frequently linked to serious health issues like foot ulcers and retinopathy. Chronic back pain has been associated with markers of diabetes disease progression, indicating that uncontrolled diabetes may be a factor in the onset of chronic back pain.[19] The Oswestry Disability Index is a crucial condition-specific outcome measure employed in the management of spinal disorders.[20] We compared ODI with diabetic profile parameters and microalbuminuria, in people with and without diabetes, including 200 participants experiencing back pain. Of these, 59 had diabetes, while 141 were non-diabetics. The diabetic patients were significantly older (59.86±12.15 years) than the non-diabetics (50.99±15.35 years). Overall, there was an equal distribution of all 200 patients by gender. While diabetics had a higher proportion of females, non-diabetics had a higher proportion of males. Similar findings for age were reported by Nagata et al but they had more male diabetic patients.[21] According to Armaghani the average age was 58±13 years, and 43% of the participants had diabetes.[22] Similar to the current study, Arnold et al observed a statistically significant age difference between patients with diabetes and those without diabetes.[23] Lima Florencio et al found that there was no discernible variation in patient distribution based on age and gender between individuals with diabetes and those without diabetes.[24] Chronic low back pain (CLBP) is a prevalent condition in the general population, affecting almost 60% of older adults. Several risk factors for chronic low back pain include unhealthy behaviors, psychiatric disorders, increased disability, and elevated mortality rates.[25] An increasing amount of scholarly literature has investigated the correlation between diabetes and back pain with respect to persistent physiological ailments, albeit with some variations in the outcomes of these investigations.[26-28] According to Lima et al 34.8 percent of people with diabetes and 29.0 percent of people without diabetes have CLBP.[24]

In the present study, the distribution of patients according to ODI ranges and study groups, i.e., diabetics and non-diabetics, was also statistically significant, with more patients in the diabetic group having a higher ODI score compared to non-diabetics. Hence, Diabetes' possible link to low back pain. Heuch et al conducted a cohort study on women and presented evidence of a statistically significant connection between the presence of low back pain at

baseline and the risk of developing diabetes.[26] Upon completion of the follow-up period in their research, female individuals experiencing chronic low back pain exhibited a diabetes risk that was approximately 30% greater. In a separate investigation, Heuch and colleagues observed that males with diabetes exhibited a 43% increased likelihood of experiencing chronic low back pain (CLBP) after an 11-year monitoring period.[28] However, the absence of a statistically significant gender disparity in the associations aligns with the present study's outcomes. Individuals diagnosed with diabetes exhibit a statistically significant increase in the likelihood of experiencing lower back pain by 24% to 35% when compared to the general population. The imbalances in blood sugar, insulin, and free radicals associated with diabetes can subject spinal discs to unfavourable stress, leading to a significantly increased risk of experiencing back pain.[29] Several academic studies have established a correlation between unmanaged diabetes and its associated symptoms, including hyperglycemia, and the degeneration of the spinal cord.[30-32]

In the current study, patients with diabetes had significantly higher levels of diabetic parameters, including blood glucose, HbA1c, and microalbuminuria, compared to those without diabetes. Age, BSL-R, and HbA1c were significantly positively associated with an ODI score, while microalbuminuria had no association. pointing to the link between diabetes severity and patients' increased experience of back pain. No correlation was found between microalbuminuria and any of the other measured variables. Consistent with the results of the present investigation, Nagata and colleagues observed that the postoperative ODI score was inferior in the diabetic cohort compared to the non-diabetic cohort.[21] Armaghani et al reported notable dissimilarities among the groups in the ODI, wherein the non-diabetic cohort manifested superior improvement.[22] Arnold et al reported that there were no observable variations in preoperative ODI between the groups of diabetic and non-diabetic patients.[23] However, there was a significant improvement observed in both groups from the baseline to the 12 and 24-month follow-up periods. Similar to the current study, Hassoon et al found that adults with diabetes had mean haemoglobin A1c (HbA1c) levels of 7.2 percent compared to 5.5 percent for adults without diabetes, and that diabetics had a higher prevalence of CLBP (19.8 percent) than those without diabetes (12.9 percent).[33]

High sugar levels, specifically glucose and sorbitol, a byproduct of glucose, are linked to diabetes. High blood sugar levels, in particular for the cells of the intervertebral spinal disc, tend to change the extracellular matrix and increase the rate of cell death. The implication here is that these cellular alterations cause the disc's natural ageing process to accelerate.[34,35] Metabolic disorders such as hypertension, hypertriglyceridemia, and hyper-cholesterolemia have been found to be associated with diabetes. The sequence of occurrences leads to the release of unbound plasma fatty acids and an inflammatory condition that promotes the calcification of blood vessels. This process can subsequently impede the blood flow to vertebral discs, rendering individuals with chronic inflammatory ailments. A common mechanical consequence of diabetes is functional limitation brought on by increased strain on weight-bearing joints. Diabetes induces a perturbed metabolic state that increases the likelihood of obesity and exacerbates the condition through the presence of a persistent inflammatory response.[36]

Limitations

Limitation of the study were multiple metabolic disorders may be linked Diabetes which may act as an cofounding factor for raise in level of blood parameters specially microalbuminuria and thus correlation was difficult to establish in the study. Monitoring activities of daily living was not feasible during the study. ODI score was subjective in nature which may not be precise. Due to COVID-19 also large sample was not able to be studied to further prove the objectives of study.

CONCLUSION

The current study aimed to assess the correlation between the ODI as a metric for low back pain in patients with and without diabetes. The current study comprised a sample size of 200 individuals who reported experiencing low back pain. Out of the total sample size of 200, 59 individuals (29.5%) were identified as having diabetes, while the remaining 141 individuals (70.5%) did not have diabetes. A significant positive association of age, BSL R and HbA1c in Diabetics with ODI score was noted. The correlation of ODI score with microalbuminuria was not significant, which may be due to other underlying comorbidities in both diabetic and non-diabetic patients' group for which microalbuminuria levels would be noted. Other conditions in which microalbuminuria can be raised are such as kidney disease, cardiovascular disease, Obesity, hypertension, and smoking. Thus, the patients in the non-diabetic group having any of the above mentioned conditions may affect the microalbuminuria levels in them. Thus, no correlation was found between microalbuminuria and ODI score. Hence, we can conclude that diabetic patients have more back pain compared to non-diabetic patients and there is need for further detailed evaluation for relation of microalbuminuria with low back pain in future studies.

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REFERENCES

1. Woolf AD, Erwin J, March L. The need to address the burden of musculoskeletal conditions. Best Pract Res Clin Rheumatol. 2012;26(2):183-224.

2. Hoy D, March L, Brooks P, Blyth F, Woolf A, Bain C, et al. The global burden of low back pain: estimates from the Global Burden of Disease 2010 study. Ann Rheum Dis. 2014;73:968-74.
3. Cust G, Pearson JCG, Mair A. The prevalence of low back pain in nurses. Int Nurs Rev. 1972;19(2):169-79.
4. Aro S, Leino P. Overweight and musculoskeletal morbidity: a ten-year follow up. Int J Obes. 1985;9(4): 267-75.
5. Anderson GBI. The epidemiology of spinal disorders. In; frymoyer JW, ed. The adult spine; priciples and practices. 2nd ed. Philadelphia: Lippincott-Raven; 1997:93-141.
6. Samartzis D, Karppinen J, Cheung JPY, Lotz J. Disk degeneration and low back pain: are they fat-related conditions? Global Spine J. 2013;3:133-44.
7. Livshits G, Popham M, Malkin I, Sambrook PN, Macgregor AJ, Spector T, et al. Lumbar disc degeneration and genetic factors are the main risk factors for low back pain in women: the UK Twin Spine Study. Ann Rheum Dis. 2011;70(10):1740-5.
8. Sanada H, Yokokawa H, Yoneda M, Yatabe J, Sasaki YM, Williams SM, et al. High body mass index is an important risk factor for the development of type 2 diabetes. Intern Med. 2012;51(14):1821-6.
9. Sakellaridis N. The influence of diabetes mellitus on lumbar intervertebral disk herniation. Surg Neurol. 2006;66(2):152-4.
10. Anekstein Y, Smorgick Y, Lotan R, Agar G, Shalmon E, Floman Y, et al. Diabetes mellitus as a risk factor for the development of lumbar spinal stenosis. Isr Med Assoc J. 2010;12(1):16-20.
11. Guzman JZ, Skovrlj B, Shin J, Hecht AC, Qureshi SA, Iatridis JC, et al. The impact of diabetes mellitus on patients undergoing degenerative cervical spine surgery. Spine. 2014;39(20):1656-65.
12. Guzman JZ, Iatridis JC, Skovrlj B, Cutler HS, Hecht AC, Qureshi SA, et al. Outcomes and complications of diabetes mellitus on patients undergoing degenerative lumbar spine surgery. Spine. 2014;39(19):1596-604.
13. Croft PR, Rigby AS. Socioeconomic influences on back problems in the community in Britain. J Epidemiol Community Health. 1994;48(2):166-70.
14. Bigos SJ, Battié MC, Spengler DM, Fisher LD, Fordyce WE, Hansson T, et al. A longitudinal, prospective study of industrial back injury reporting. Clin Orthop. 1992;279:21-34.
15. Brown JR. Factors contributing to the development of low back pain in industrial workers. Am Ind Hyg Assoc J. 1975;36(1):26-31.
16. Biering-Sorensen F. Physical measurements as risk indicators for low-back trouble over a one-year period. Spine. 1984;9(2):106-19.
17. Bigos SJ, Spengler DM, Martin NA, Zeh J, Fisher L, Nachemson A. Back injuries in industry: a retrospective study. III. Employee-related factors. Spine. 1986;11(3):252-6.
18. Pandey SK, Sharma V. World diabetes day 2018: Battling the Emerging Epidemic of Diabetic Retinopathy. Indian J Ophthalmol. 2018;66(11):1652-3.
19. Rinaldo L, McCutcheon BA, Gilder H, Kerezoudis P, Murphy M, Maloney P, et al. Diabetes and back pain: markers of diabetes disease progression are associated with chronic back pain. Clin Diab. 2017;35(3):126-31.
20. Fairbank JC, Pynsent PB. The Oswestry Disability Index. Spine. 2000;25(22):2940-52.
21. Nagata K, Nakamoto H, Sumitani M, Kato S, Yoshida Y, Kawamura N, et al. Diabetes is associated with greater leg pain and worse patient-reported outcomes at 1 year after lumbar spine surgery. Sci Rep. 2021;11: 8142.
22. Armaghani SJ, Archer KR, Rolfe R, Demaio DN, Devin CJ. Diabetes Is Related to Worse Patient-Reported Outcomes at Two Years Following Spine Surgery. J Bone Joint Surg Am. 2016;98(1):15-22.
23. Arnold PM, Fehlings MG, Kopjar B, Yoon ST, Massicotte EM, Vaccaro AR, et al. Mild diabetes is not a contraindication for surgical decompression in cervical spondylotic myelopathy: results of the AOSpine North America multicenter prospective study (CSM). Spine J. 2014;14(1):65-72.
24. Lima Florencio L, Lopez-de-Andres A, Hernández-Barrera V, Palacios-Ceña D, Fernández-de-Las-Peñas C, Jimenez-Garcia R, et al. Is There an Association between Diabetes and Neck and Back Pain? Results of a Case-Control Study. J Clin Med. 2020;9(9):2867.
25. Jacob L, Rathmann W, Koyanagi A, Haro JM, Kostev K. Association between type 2 diabetes and chronic low back pain in general practices in Germany. BMJ Open Diab Res Care. 2021;9:e002426.
26. Heuch I, Heuch I, Hagen K, Sørgjerd EP, Åsvold BO, Zwart JA. Is chronic low back pain a risk factor for diabetes? the Nord-Trøndelag health study. BMJ Open Diab Res Care. 2018;6:e000569.
27. Suri P, Boyko EJ, Rundell SD, Smith NL, Goldberg J. Do medical conditions predispose to the development of chronic back pain? A longitudinal co-twin control study of middle-aged males with 11-year follow-up. BMC Musculoskelet Disord. 2018;19:362.
28. Heuch I, Heuch I, Hagen K, Sørgjerd EP, Åsvold BO, Zwart JA. Does diabetes influence the probability of experiencing chronic low back pain? a population-based cohort study: the Nord-Trøndelag health study. BMJ. 2019;9:e031692.
29. Pozzobon D, Ferreira PH, Dario AB, Almeida L, Vesentini G, Harmer AR, et al. Is there an association between diabetes and neck and back pain? A systematic review with meta-analyses. PLoS One. 2019;14(2):e0212030.
30. Park EY, Park JB. Dose- and time-dependent effect of high glucose concentration on viability of notochordal cells and expression of matrix degrading and fibrotic enzymes. Int Orthop. 2013;37(6):1179-86.
31. Kong JG, Park JB, Lee D, Park EY. Effect of high glucose on stress-induced senescence of nucleus pulposus cells of adult rats. Asian Spine J. 2015;9(2): 155-61.

32. Kong CG, Park JB, Kim MS, Park EY. High glucose accelerates autophagy in adult rat intervertebral disc cells. Asian Spine J. 2014;8(5):543-8.
33. Hassoon A, Bydon M, Kerezoudis P, Maloney PR, Rinaldo L, Yeh HC. Chronic low-back pain in adult with diabetes: NHANES 2009-2010. J Diab Complicat. 2017;31(1):38-42.
34. Robinson D, Mirovsky Y, Halperin N, Evron Z, Nevo Z. Changes in proteoglycans of intervertebral disc in diabetic patients. A possible cause of increased back pain. Spine. 1998;23(8):849-56.
35. Cheng X, Ni B, Zhang Z, Liu Q, Wang L, Ding Y, et al. Polyol pathway mediates enhanced degradation of extracellular matrix via p38 MAPK activation in intervertebral disc of diabetic rats. Connect Tissue Res. 2013;54(2):118-22.
36. Shahid S, Akhter Z, Sukaina M, Sohail F, Nasir F. Association of diabetes with lower back pain: a narrative review. Cureus. 2021;13(6):e15776.

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